


Introduction to Measurements - Volume

Volume in Math and Science

The amount of that an object takes in space based on physical size

What Is Volume?

VOLUME IS THE THREE-DIMENSIONAL SPACE OCCUPIED BY A SOLID, LIQUID, OR GAS



$l \times w \times h$ $\frac{1}{3}\pi r^2 h$ $\frac{1}{3}l^2 h$ $\frac{4}{3}\pi r^3$ $\pi r^2 h$

Units include liters, cubic meters, cubic centimeters, fluid ounces, gallons, and quarts.

sciencenotes.org

In math and physics the volume of an object is based on the shape of an object.

Square objects just measure the sides of an object where circles, cones, triangles, and cylinders using more complex formulas using pi (π), 3.14...

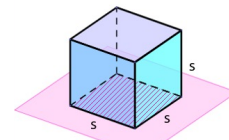
2

Introduction to Measurements - Volume

Volume of a Solid

The amount of space (*in 3D*) that a solid takes up in the environment

Volume of Cube

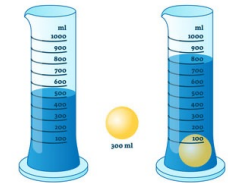


Volume of cube with side lengths s

$$V = s \times s \times s = s^3$$

VOLUME MEASURE

Volume of an object based on direct length measurements (*left*) or volume by displacement (*right*)

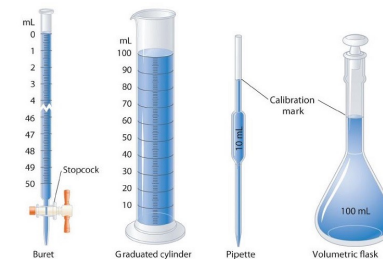


3

Introduction to Measurements - Volume

Volume of a Liquid

The amount of space (*in 3D*) that a liquid takes up in the environment



Volume of liquids are measured directly using volumetric glassware.

Multiple Volumes
Buret or Graduated Cylinder

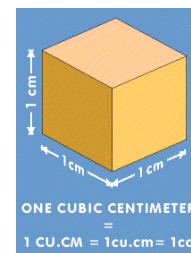
Single Volumes
Pipette or Volumetric Flask

4

Introduction to Measurements - Volume

Recording Volume Measurements – Units of Volume

The main unit of volume is based on the size of a solid cube



Solid Volume

Volume is based on the physical space within the cube.

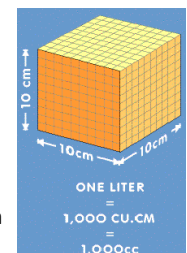
$$1\text{cm}^3 = 1\text{cm} \times 1\text{cm} \times 1\text{cm}$$

$$1\text{m}^3 = 1\text{m} \times 1\text{m} \times 1\text{m}$$

Liquid Volume

Volume based on cube conversion

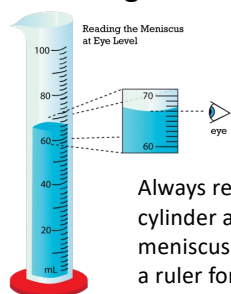
$$1\text{cm}^3 = 1\text{mL} \quad 1\text{m}^3 = 1\text{L}$$



5

Introduction to Measurements - Volume

Recording Volume in a Graduated Cylinder



Reading the Meniscus
at Eye Level

Any liquid will leave a *meniscus*, a curvature on the wall of a buret or graduated cylinder

Always read the graduated cylinder at the bottom of the meniscus like you would read a ruler for length

